



Features

- 17mm x 12.0mm x 2.4mm
- CSR8670 chip set
- Bluetooth v4.2 Classic + Low Energy
- Class 1 radio, range typically exceeds 100m
- +10dB PA Output RF Gain
- Analog differential stereo inputs and outputs
- Digital stereo inputs and outputs
- 7 programmable digital I/O pins
- External antenna port
- 16 Mbit flash memory
- USB, UART, PCM interfaces

Description

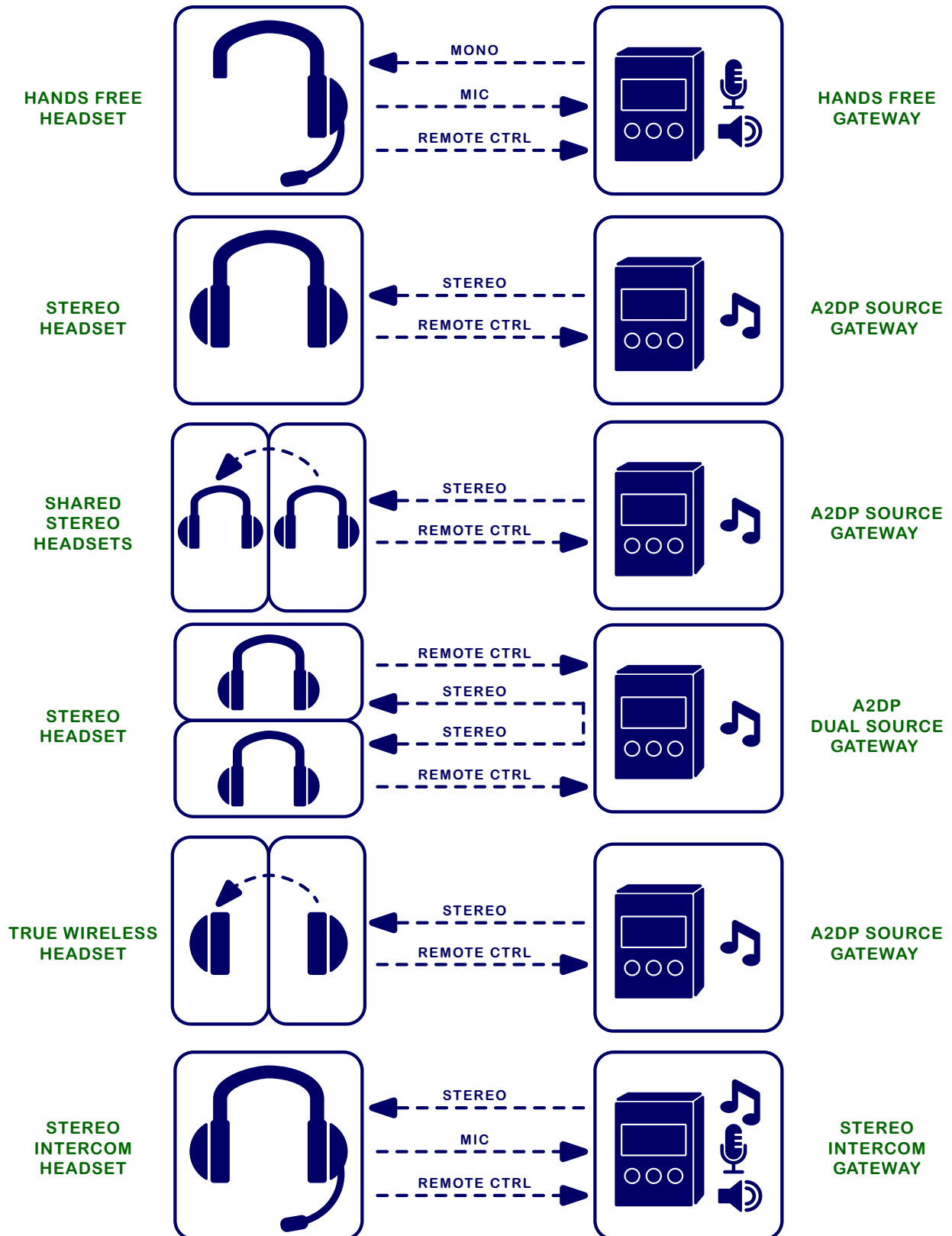
The KC-5070 Class 1 Bluetooth Audio Module is a highly tuned and completely integrated wireless audio transceiver subsystem ready for installation in audio devices. The KC-5070 is a pre-engineered subsystem integrating a wireless radio, digital audio system, and programmed firmware profiles that define features, configurations, and user interface. All firmware offered by KC Wirefree can be customized for OEM clients. In many cases a few changes can produce great value by differentiating and improving your product. Firmware can be updated via USB. Please see our **Audio User Guides** for more information on specific features and operation.

Bluetooth Audio Profiles

- A2DP - Advanced Audio Distribution Profile
Stereo streaming with SBC, AAC, (optional APTX). Source or Sink profile.
- AVRCP - Audio Video Remote Control Profile
Standard remote audio playback controls. Controller or Target profile.
- AGHFP - Audio Gateway to HFP
Standard bi-directional mono cell phone gateway profile connects to HFP mono headsets.
- HFP - Hands Free Profile
Standard bi-directional mono cell phone headset profile.
- Custom Profiles Available
Contact us for non-standard or enhanced audio capabilities.



Audio Profiles Overview



kcGateway Firmware Edition

The kcGateway firmware is a transmitter system, offering A2DP source profile or AGHFP gateway profile (default), but not both simultaneously. A2DP mode provides stereo transmission to Headset/Speaker devices. Stereo audio is sampled from the MIC_LP, MIC_LN, MIC_RP, and MIC_RN pins at 44.1kHz, and will automatically transmit to a Headset device. AGHFP mode (default) provides two-way voice communications, sampled at 8kHz, to a standard Bluetooth cell phone headset. Additionally, receiving a headset Voice Command feature (usually pressing the main button on a standard headset from idle mode) will toggle the PTT output pin on kcGateway. Please refer to our *kcGateway User Guide* for details.

kcHeadset Firmware Edition

The kcHeadset firmware is a receiver system, offering A2DP sink profile, and HFP profile. It can receive an A2DP wireless stereo signal, decompress, and convert to analog audio available on the SPK_LP, SPK_L-, SPK_RP, and SPK_RN pins. Additionally, it can “answer” phone calls, which will pause any A2DP stream, and switch modes, now providing two way mono communication channel. Please refer to our *kcHeadset User Guide* for details.

kcTrueStereo Firmware Edition

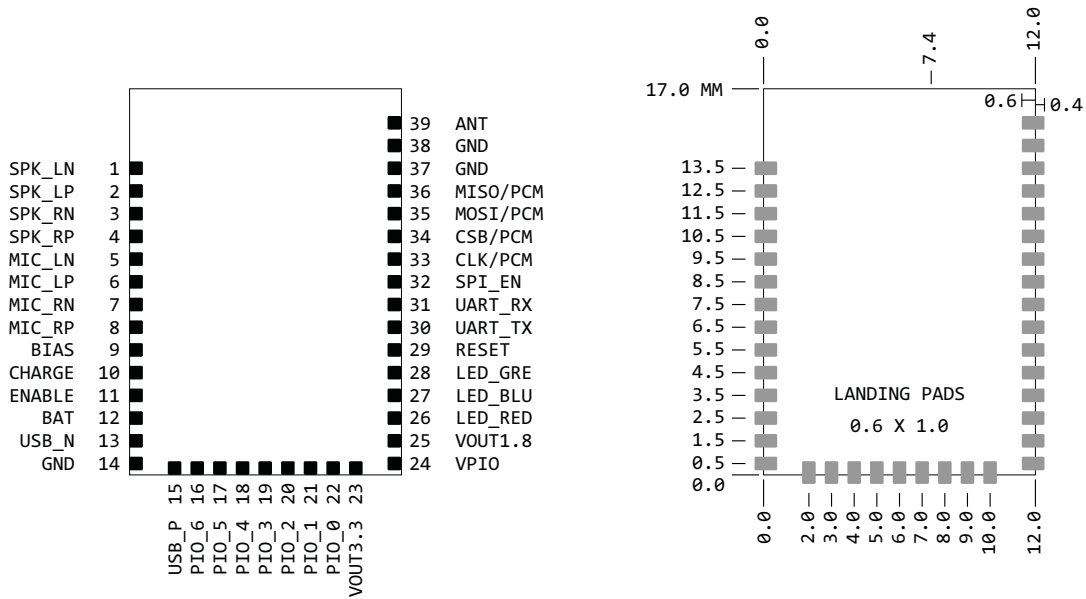
We have a stereo receiver profile, implementing CSR’s proprietary TrueWireless profile. TrueWireless offers separate left and right receivers, which requires two receiver modules with kcTrueStereo. This firmware can also operate as a standard Bluetooth A2DP stereo headset and HFP mono headset. Please refer to our *kcTrueStereo User Guide* for details.

KCSI Stereo + Intercom Profile

We have a custom profile available by special request, that offers a 3-channel (Stereo + Intercom) low latency communication system. There are two major features in the KCSI profile that do not exist in standard Bluetooth A2DP: the low latency connection, and the simultaneous return mic audio channel. As this is a non-standard profile, both a KCSI enabled kcGateway and kcHeadset device on each end is required.

Dimensions & Layout

KC-5070 Top View



KC-5170 Bottom View



Pin Assignments

Pin	Function	Type	Description
1	SPK_LN	Output	Analog Audio Output
2	SPK_LP	Output	Analog Audio Output
3	SPK_RN	Output	Analog Audio Output
4	SPK_RP	Output	Analog Audio Output
5	MIC_LN	Input	Analog Audio Input
6	MIC_LP	Input	Analog Audio Input
7	MIC_RN	Input	Analog Audio Input
8	MIC_RP	Input	Analog Audio Input
9	BIAS	Output	Microphone Bias
10	CHARGE	Input	Battery Charging Supply
11	ENABLE	Input	Module Enable
12	BAT	Input	Battery Positive Terminal
13	USB_DN	I/O	USB Data Negative
14	GND	--	Ground
15	USB_DP	I/O	USB Data Positive
16	PIO_6	I/O	Programmable I/O
17	PIO_5	I/O	Programmable I/O
18	PIO_4	I/O	Programmable I/O
19	PIO_3	I/O	Programmable I/O
20	PIO_2	I/O	Programmable I/O
21	PIO_1	I/O	Programmable I/O
22	PIO_0	I/O	Programmable I/O
23	VOUT_3.3	Output	3.3V Supply Output
24	VPIO	Input	PIO, UART, PCM, SPI Voltage Supply Input (Select 1.8V or 3.3V)
25	VOUT_1.8	Output	1.8V Supply Output
26	LED_RED	Input	Led Open Drain
27	LED_BLU	Input	Led Open Drain
28	LED_GRN	Input	Led Open Drain
29	RESET	Input	Reset (Activate 5ms Low)
30	UART_TXD	Output	UART Transmit
31	UART_RXD	Input	UART Receive
32	SPI_EN	Input	SPI Enable (SPI=High, PCM=Low)
33	SPI_CLK	Input	SPI Clock [PCM Audio Clock]
34	SPI_CSB	Input	SPI Select [PCM Audio Sync]
35	SPI_MOSI	Input	SPI Master Out [PCM Audio Out]
36	SPI_MISO	Output	SPI Master In [PCM Audio In]
37	GND	--	Ground
38	GND	--	Ground
39	ANT	IO	Antenna port

[Option features in brackets]

Power Interface Pins

Minimum connections for power up are VPIO pin, GROUND pins, and main power supply to either CHARGE pin or BAT + ENABLE pins.

Power supply to module should have less than 10mVrms noise between 0-10MHz, and spikes should be minimal.

BAT Pin [12]

Positive battery terminal. Designed for use with Lithium Ion rechargeable batteries. Typically, a battery is permanently connected to this pin, and the ENABLE pin provides power up and power down functionality.

This pin will also recharge the battery when the voltage level is low, and a power supply is provided on the CHARGE pin. If the CHARGE pin is used for main power supply, leave the BAT pin, and ENABLE pin unconnected.

CHARGE Pin [10]

The CHARGE pin is used for recharging an attached Lithium Ion battery, or alternatively, can be used instead of a battery. The CHARGE pin is recommended when using a DC power supply.

When power is supplied to the CHARGE pin, the unit will remain powered up. The firmware may not be running (limbo mode), but the device will still be on.

ENABLE Pin [11]

Enables power up when using the BAT pin for power supply. It has a weak internal pull down. The ENABLE has internal latch up capability (controlled by firmware), and can power up with a momentary button press (with internal latch up), or can be held high with a switch.

The functions of the BTB (Bluetooth Button) are duplicated on the ENABLE pin. So, if the ENABLE pin is used with a momentary button press for power up, and latched internally, subsequent presses on the ENABLE pin/button will provide the same functionality for connections, pairing, and phone calls as the BTB. A very long press and hold will power down the device.

If the internal latch up is disabled in firmware, then the device will power down when the ENABLE pin is low.

RESET Pin [29]

The module will reset when pulled LOW >5ms.

VOUT Pins [23, 25]

1.8V and 3.3V auxiliary supply. Not intended to supply significant current for external components.

VPIO Pin [24]

Mandatory. Connect to one of the VOUT supply pins. Power supply to the IO systems, including IO pins, PCM, SPI, UART, USB.

ANT Pin [39]

Mandatory. A 50 ohm antenna port. Suitable to directly connect an SMA connector, U.FL connector, or ceramic antenna. Use a properly designed 50 ohm co-planar waveguide transmission line for lengths exceeding 2mm.

Audio Interface Pins

SPK Pins [1-4]

Output gain is adjustable from -45dB to +21dB. DAC can operate at 8, 11.025, 16, 22.05, 32, 44.1, and 48kHz.

MIC Pins [5-9]

Microphone or line level analog audio input. Impedance is 6.0k Ω - 30k Ω depending on volume setting. ADC operates at 8, 11.025, 16, 22.05, 32, 44.1, and 48kHz. Input signal is 4mVrms – 800mVrms dependent upon the input gain setting of -27dB to +63dB.

The Mic Bias pin provides a DC bias intended for electret microphones. Configurable 1.8V – 3.3V (default = 2.69V) with a current of 200 μ A – 1.229mA (default = 0.672mA).

PCM Pins [32-36]

The PCM digital audio pins operate at the VPIO voltage level. The PCM pin features are available when SPI_EN is low. Digital audio supports PCM, I2S, and SPDIF formats.

IO Interface Pins

UART Pins [30-31]

The UART default setting is 115200-8-N-1 no flow control. The UART operates at the VPIO voltage level. Not all firmware editions offer a command and data interface using UART. Refer to the firmware User Guides for implementations.

SPI Pins [32-36]

The SPI interface used for programming and diagnostic applications only, and is unavailable for general usage. We highly recommend including test points for the five SPI pins. The SPI operates at the VPIO voltage level, and is available when SPI_EN is high, otherwise the PCM interface is available when SPI_EN is low.

LED Pins [26-28]

Three open-drain LED output pins are available. The LED's need a positive supply, a current limiting resistor, and connection to these open drain pins.

USB Pins [13, 15]

USB is used for Firmware Updates by default. Optionally, the USB can be programmed for plug-n-play audio utilizing standard USB audio drivers available on PC, Mac, and Linux.

PIO Pins [16-22]

PIO pins are low by default, and button presses used for device operation are high signals. The PIO pins operate at the VPIO voltage level. Voltage input tolerance and output level is directly related to the VPIO voltage level. PIO inputs are debounced for 20ms. PIO pins are assigned many default functions in various versions of firmware which are detailed in the firmware User Guides. Custom programmed functions are available. Inputs can be configured for weak pullup, weak pulldown, strong pullup, strong pulldown.

Electrical Characteristics

(Conditions VDD = 3.3V and 25 °C)

Absolute Maximum Ratings	Min	Max	Unit
Storage temperature range	-40	105	°C
Supply voltage VDD	-0.4	4.4	Volts
Supply voltage CHARGE	-0.4	5.75	Volts
Supply voltage ENABLE	-0.4	4.4	Volts

Recommended Operating Conditions	Min	Typical	Max	Unit
Temperature range	-40	20	+85	°C
Supply voltage VDD	2.5	3.7	4.25	Volts
Supply voltage ENABLE	0	3.7	4.25	Volts
Supply voltage CHARGE	4.75	--	5.75	Volts

Current Consumption	Avg	Unit
Stereo	13	mA
Mono Headset	10	mA
Standby (connected without audio)	0.5	mA

RF Characteristics	Max	Unit
Transmission Line	50	Ω
Max Transmission Power	+10	dBm
Receive Sensitivity	-90	dBm

Audio DAC Characteristics	Min	Typical	Max	Unit
Output voltage full scale swing (differential)	--	750	--	mVrms
Resolution	--	--	16	Bits
Sample Rate	8	--	96	kHz
SNR (@ 48KHz sampling)	--	96	--	dB
Digital Gain	-24	--	21.5	dB
Analog Gain	-21	--	0	dB
Stereo Separation	--	-88	--	dB
THD+N (8kHz @ 100kΩ load)	--	0.002	--	%
THD+N (48kHz @ 16Ω load)	--	0.004	--	%

Audio ADC Characteristics	Min	Typical	Max	Unit
Input full scale at maximum gain (differential)	--	4	--	mVrms
Input full scale at minimum gain (differential)	--	800	--	mVrms
Resolution	--	--	16	Bits
Sample Rate	8	--	48	kHz
SNR (@ 8KHz sampling)	--	93	--	dB
SNR (@ 48KHz sampling)	--	92	--	dB
Digital Gain	-24	--	21.5	dB
Analog Gain	-3	--	42	dB
Stereo Separation	--	-89	--	dB
THD+N (8kHz)	--	0.004	--	%
THD+N (48kHz)	--	0.008	--	%

Programmable I/O Pins Operating Characteristics	Min	Typical	Max	Unit
Input Voltage Low Logic	-0.4	--	0.4	Volts
Input Voltage High Logic	0.7 x VPPIO	--	VPPIO + 0.4	Volts
Output Voltage Low Logic	--	--	0.4	Volts
Output Voltage High Logic	0.75 x VDD	--	--	Volts
Output Current Low Logic	10	40	150	μA
Output Current High Logic	-150	-40	-10	μA
Input Capacitance	1.0	--	5.0	pF
Weak pull up	500K	--	2M	Ω
Weak pull down	500K	--	2M	Ω
Strong pull up	10K	--	50K	Ω
Strong pull down	10K	--	50K	Ω

[VPPIO is 1.8V or 3.3V]

Circuit Example

Pre Qualifications

Bluetooth

Usage of Bluetooth registered trademarks must be licensed directly from Bluetooth SIG. Listing Fees are \$8,000 or \$2,500 for Small Business Incentive Program.

<https://www.bluetooth.org/en-us/test-qualification/qualification-overview/fees>

If your Bluetooth card/adaptor/component is clearly marketed as a KC Wirefree Bluetooth device, you may be able to use our existing KC Wirefree product Listing, and an additional Listing Fee may not be necessary.

The KC-5170 is registered with, and licensed by Bluetooth SIG as a qualified design.

Qualification Design ID: 49866

Qualified Profiles: A2DP, AVRCP, GAP, GATT, HCI, HFP, HSP, L2CAP, RFCOMM, SPP

FCC

The KC-5170 has a granted modular approval by the Federal Communications Commission. The module meets the conducted and radiated emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for Bluetooth spread spectrum transmitters.

With a written agreement, Original Equipment Manufacturers may use our FCC ID transmitter license. The following FCC ID must be visible on the exterior of final the product.

FCC ID: S22-BTAUDIO

Industry Canada

IC Warning Statement: The device's user manual does not contain the following or equivalent statement as per RSS-GEN section 7.1.5: Operation of this device is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

With a written agreement, Original Equipment Manufacturers may use our IC ID transmitter license. The following IC ID must be visible on the exterior of final the product.

IC ID: 8193A-BTAUDIO

CE

Pending.

RoHS

RoHS compliant.

SAR

SAR compliant.

Datasheet Revisions

Revision	Changes
Aug 29, 2016	

Ordering Information

Product Id	KC-5070
Product Version	2
Country of Manufacture	USA
Order Part Number	Description
KC-5070-GW	BlueAudio Module Class 1 w/ kcGateway Firmware
KC-5070-HS	BlueAudio Module Class 1 w/ kcHeadset Firmware
KC-5070-FW	BlueAudio Module Class 1 w/ Custom Firmware

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